SCIENCE NEWS

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THE MASS OF THE X PARTICLE

DR. SETH H. NEDDERMEYER, of the California Institute of Technology, in an article published by the *Physical Review,* states that the mass of the new-found "X" particle which scientific investigators have been discovering in cosmic ray research may not have a fixed value.

Dr. Neddermeyer is a colleague of Dr. Carl Anderson and worked with him when the latter made the discovery of the positron for which he received the Nobel Prize award. Anderson and Neddermeyer made the initial discoveries of the "X" particle, whose mass appears to be intermediate between that of the electron and the proton.

Dr. Neddermeyer writes that "There are . . . reasons for believing that the mass (of the X particle) may not be unique and that many masses, ranging from a few times the electron mass up to very large values, may exist." By theory, photons of radiant energy create pairs of particles—positive and negative in electrical sign—in their rush through the atmosphere on their way to earth. The energy and mass possessed by these new particles, that are the offspring of dying photons, are variable. Thus many different masses might be observed, depending on the energy possessed by the original photon that creates them. The point is that particles can have two kinds of mass; the so-called rest mass and a mass due to motion. Theoretically, at least, a particle moving with the speed of light should have an infinitely large mass. The second kind of mass, which varies with the speed of the particle, was observed in the present experiments.

A NEW MICROSCOPE

THERE has been constructed at Harvard University a microscope more than four times as powerful as any microscope ever built before.

Designed by two Harvard geologists, Drs. E. C. Dane, Jr., and L. C. Graton, the new instrument can magnify up to 50,000 diameters, enough to blow the period at the end of this sentence up to the size of a two-story house. Its effective magnification—the limit at which no new details are shown—is 6,000 diameters, more than four times the previous limit. So powerful is it in comparison to its smaller contemporaries that it far surpasses what was believed a year ago to be the theoretical limit of the usefulness of a microscope.

Much of this magnification is "empty," resembling that of a large photographic print produced from a miniature negative. Effective magnification, producing more visible detail as it increases, up to 6,000 diameters is secured with this instrument. Weighing about a ton, the microscope is mounted on the steel bed of a lathe, to secure stability. So fine are the focussing screws that it would take 25 minutes of rapidly turning them by hand to produce a motion of 1/400 of an inch. Motors, with several speeds, do the turning more quickly.

Used chiefly for examining ores, this microscope catches images too small to be detected by ordinary instruments. Objects only a hundred times as large as an atom can be seen and photographed. With the theoretical limits already passed, there seems to be no reason why even greater magnifications, with lenses designed according to revised theories, can not be made. Already, another of these microscopes, patterned after the original model, but slightly improved, has been installed by the Canadian Department of Mines, in Ottawa, to be used in the minute study of ores.

EPIDEMIC DIARRHEA OF THE NEW-BORN

DRS. SAMUEL FRANT and Harold Abramson, of the New York City Health Department, report, in the forthcoming issue of the *American Journal of Public Health,* that the mysterious diarrheal malady that has afflicted infants in Chicago hospitals is not limited to that city. Epidemics of the same sort and probably of the same disease have occurred in many cities in this country and abroad.

The malady has been responsible for a steady increase in mortality among new-born babies in recent years, found chiefly among infants one month old or less. The malady is epidemic diarrhea of the new-born. It is not related to the summer diarrhea which took toll of babies a generation ago. The new malady afflicts infants born in hospitals and strikes during the first three or four weeks of life. No cause has yet been found for the disease. It has been reported in Seattle, Toronto, Memphis, New York, Chicago, Rochester, N. Y., Buffalo, Teaneck, N. J., Cincinnati, Cleveland, Edinburgh, Scotland and Garches, France. In New York there have been 23 such outbreaks in the past three years, affecting 711 infants, of whom 335 died.

The only known way of fighting the disease at present is to break the chain of infection in hospital nurseries from one infant to another. Usual methods of safeguarding infants in hospital nurseries have apparently not been sufficient to prevent the spread of this disease once it starts, and consequently Drs. Frant and Abramson recommend certain new methods to doctors and hospital authorities.

SOYBEAN PLASTIC

SOYBEAN protein plastic is understood to be used in the manufacture of the steering wheel, horn button and other such parts of Ford cars. It is first cousin to casein plastics, made from the jelly-like or cheese curds of milk, which have wide commercial use in buttons, buckles, radio and electrical parts, etc. The soybean is four tenths protein compared with two tenths oil. The protein portion can be mixed with water, various chemicals, colors and filler material, such as wheat chaff, wood flour, etc., to make a useful member of the great group of materials called "plastics." Heat and pressure are used to temper the plastic after it is put into the desired shape.

In addition to development undertaken by Ford and other manufacturers, the Federal Government, through the Bureau of Chemistry and Soils of the Department of Agriculture, established early last year a soybean industrial research laboratory at Urbana, Ill., in cooperation

with twelve North Central states. Here some 30 chemists and other staff members are developing and improving industrial uses of soybeans. The Farm Chemurgic Council has been urging the industrial and other use of soybeans for several years as a part of its program to obtain the use of more American-grown agricultural products in industry.

Although the soybean was introduced in the United States as early as 1804, it is still one of the young giants in our industrial and agricultural life. In the Orient its uses have been many from time immemorial. In recent years the amount of soybean planted has increased greatly. Acreage in 1907 was only 50,000; in 1937 it was 6,049,000 according to preliminary figures. The 1937 crop was between 36,000,000 and 40,000,000 bushels of the bean itself. It is estimated that some 50 factories are turning out various industrial soybean products. Soybeans are used in making such articles as paint, enamel, varnish, glue, printing ink, rubber substitutes, linoleum, insecticides, glycerin, flour, soy sauce, breakfast food, candies, roasted beans with nutlike flavor, livestock feeds, as well as plastics.

AN INSECT ENEMY OF THE SUGAR CANE BORER

THE new insect ally of sugar cane planters was discovered quite by accident. A scientific exploring party was sent out by the Hawaiian Sugar Planters' Association, under the leadership of Cyril E. Pemberton, to seek new types of wild cane. Their boat was ship-wrecked on the New Guinea coast.

Thrown on to a forbidding and possibly hostile shore, the party occupied itself with forays into the jungles while they waited for help. They discovered a patch of cane, close to a swamp. Some of the stalks were afflicted with borers. They opened these up—and found the long-sought enemy of the pest. Marking the place of discovery, and trusting the insect's descendants would still be there when they returned, Mr. Pemberton and his party journeyed on to Honolulu. Elaborate preparations are being made for the insect's importation. With acclimatizing stations established possibly in Samoa, Fiji and New Caledonia, the attempt will be made to transplant it to Hawaii.

Life spans of such insect allies, and the tremendous distances over which they must frequently be brought, make it impossible to carry individual insects through. The originals are generally established near their homeland, where they can be watched and their food requirements studied. Insects on which they feed must be similarly treated. In some cases a whole coterie of enemies of various types must be captured, studied and carefully reared to get a single one through, and a failure in preserving any one type may destroy the chances for the entire expedition. Similarity of climates must also be taken into consideration. Too great a change in one step may spell disaster. It is nothing unusual for a year or more to be spent in carrying a single desired insect over a few thousand miles.

Successfully transplanted, there is still the very definite danger that in the insect's new homeland his life characteristics may suddenly change. An originally valuable species, after acclimatization, may lose its interests in hereditary enemies and be utterly valueless. Even more serious, it may suddenly be imbued with the inclination to cooperate with established pests, and itself become a menace that forces instant eradication.

New insects, life forms, plant species, etc., must therefore be placed in isolation where they can be watched under territorial conditions. Imprisoned in limited areas, insects and plants are placed with them, and more months allowed to pass while constant check is kept of developing tendencies. Only after positive proof of benefit are the doors opened and the new ally installed in the field.

ALCOHOL FROM THE JERUSALEM ARTICHOKE

PROFESSOR ELLIS I. FULMER, W. K. McPherson and L. A. Underkofler, of the Iowa State College, reported in *Industrial and Engineering Chemistry* that high yields of alcohol, a fuel already widely used and expected to be even more widely used in the future, can be readily secured from the Jerusalem artichoke, a tuberous plant related to the sunflower. Jerusalem artichokes grown on a single acre of ground will produce more alcohol than two or more acres of corn. Alcohol can be obtained from the plant's tubers by extraction of the carbohydrates and evaporation to a thick syrup and subsequent inoculation with alcohol-producing yeasts.

In test runs between 22 and 26 gallons of 95 per cent. alcohol per ton of fresh tubers have been obtained. In one series of experiments 28.4 gallons of 95 per cent. alcohol per ton was secured. The theoretical yield is about 29 gallons per ton, but it is expected that the maximum yield will be in the neighborhood of 90 per cent. of this figure.

The yeasts used for fermenting the carbohydrates give better results after living on the Jerusalem artichoke culture for a number of generations. The Jerusalem artichoke, which is native to the United States, was used as a food in Europe prior to general use of the potato. As it is not very palatable, since that time it has passed out of general use with the exception of a brief period during the World War when it was revived somewhat because of its high productivity.

A plant for the production of power alcohol from farm crops has been in operation at Atchison, Kans., for more than a year. Experiments with a number of crops have been tried, with the Jerusalem artichoke giving promising yields. Significance of the development lies not only in the possible necessity of eventually finding a substitute for gasoline, but also in the fact that the mechanization of agriculture during past years cut down the market for grain products, much of which were formerly consumed right on the spot. Power alcohol from crops would aid in any restoration of the balance.

ITEMS

TUSKS scattered on the frozen shore of Siberia opposite Alaska may mean that Soviet investigators will some day add more complete specimens of the extinct hairy mammoth to the two bodies already found. Like the first specimen found, the second body, which was uncovered

last October, was partially damaged by wild animals. The head, one leg and a part of the trunk had been partly eaten away. Otherwise the body was intact, preserved in the frozen earth. The tusks of the specimen have not yet been found, but they may be under its body, which has not yet been removed from the pebbly ground. Next spring, when the sea in this area is clear of ice, soundings of the coastal zone will be taken to see if a ship can approach the shore to take on board the find.

SCIENCE can hope to add about ten years to the present life expectancy in this country, making children born at some time in the future look forward to an average age of about seventy years. But gone are the days of very large additions to the normal life span, the achievement of nearly doubling the expected length of life which is the record in the 150 years since Revolutionary times. This is the verdict of Harold F. Dorn, U. S. Public Health Service statistician. The gains in life expectancy since the Revolution can be translated into some three billion years more life in the aggregate for those who happen to be living now. To-day the average boy born in the United States can expect to live to be 60.9 years, the average girl 64.4 years. If life expectancy is pushed to the maximum of 70 years, science must find a way to conquer cancer, diabetes, heart disease, nephritis and brain hemorrhage.

MAX E. NOHL, diver, who descended to a depth of 420 feet in Lake Michigan recently, withstood a pressure on his body of 320 tons more at that depth than he did at the surface. Atmospheric pressure of 15 pounds to the square inch adds up to about twelve tons when all the 3500 square inches of the average man's skin are considered. At 420 feet the pressure is about 197 pounds to the square inch. Dissolved gases in the human blood stream and body cells enable us to resist the pressure of the atmosphere. At shallow depths, compressed air helps a diver to resist water pressure, but as the pressure increases, nitrogen from the air dissolves in the blood stream, causing trouble if the diver comes to the surface too rapidly. "Bends," or caisson disease, a common and serious illness of divers, is caused by collecting nitrogen bubbles in the capillaries. These bubbles act as blood clots. To prevent this, an atmosphere of oxygen and helium, which causes fewer bubbles in the capillaries on ascending to the surface was used. If he descends to a depth of 500 feet as he plans to do in another dive, the pressure will be 380 tons more than at the surface.

VISIBLE supplies of cryolite, the essential fluxing mineral in the manufacture of aluminum by the present electrolytic process, will last at least fifty years more, according to Dr. Charles R. Toothaker, curator of the Commercial Museum, in Philadelphia. Reporting the findings of a recent mineral-collecting visit to Greenland in *Rocks and Minerals Magazine*, Dr. Toothaker describes the great pit in the shore of Arksuk Fiord from which the world's supply of this rare and valuable mineral comes. Administered by the Danish Government, the mine is worked only during the summer, the men returning to Denmark during the winter.